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Development of HadEX2: Gridded Indices of Climate Extremes

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Abstract: In this project, we propose to produce high quality, globally consistent, gridded datasets of long-term observations of climate extremes with uncertainty estimates, updated in near-real time for monitoring purposes and freely available to the public. We will then use the gridded fields to examine long-term changes in extremes and to assess the representativeness of climate model simulations. The work is expected to make a significant contribution to the Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report. The gridded datasets will be commonly referred to as HadEX2.

HadEX2 will be based on a number of large daily and sub-daily datasets that are currently available. The premier example is the National Climatic Data Center‘s (NCDC‘s) Global Historical Climatology Network (GHCN) – Daily dataset, which contains over 20,000 temperature and 40,000 precipitation stations. Another is NCDC‘s Integrated Surface Dataset, which contains subdaily observations for approximately 22,000 synoptic stations worldwide. To the extent possible, these global archives will be supplemented with variousnational- and regional-scale datasets that we will attempt to obtain through traditional methods. Reasonable efforts will be made to ensure the homogeneity of the station data prior to creating the gridded fields.

Several ―optimal‖ interpolation techniques (e.g., angular distance weighting, climatologically aided interpolation) will then be evaluated for use in the development of HadEX2. To this end, we will leverage off of the experiences and methods of several ongoing efforts. One example is HadGHCND, a joint NCDC-Met Office Hadley Centre endeavor that produced (and operationally updates) daily temperature and precipitation grids for global land areas. Another is the EU ENSEMBLES project, which has created high resolution daily temperature and precipitation grids for Europe. Regardless of the interpolation method(s) ultimately selected, however, it is critical to address two questions. The first is the mismatch between the spatial representativeness of in situ extremes, which are point measurements by definition, and that of gridded climate model output, which is often assumed to represent area mean values. The second question involves the quantification of uncertainty, both statistical and structural, in the final gridded fields.

As climate changes, as a result of natural variability and anthropogenic global warming, we need to monitor extreme events. Consequently, HadEX2 will be updated operationally on a daily basis. The new software, which will incorporate homogeneity and quality control testing, indices calculation, and gridding, will be subject to version control. The output will be available in near real time from NCDC and the Met Office Hadley Centre.